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Meaning in life research: the importance of considering auxiliary assumptions

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ABSTRACT

There have been significant advances in the science of meaning in life (MIL). Researchers have made empirical predictions about the antecedents and consequences of meaning and the best ways it can be enhanced. Yet, it is important that researchers in this area consider the auxiliary assumptions associated with their predictions. Auxiliary assumptions, which traverse the distance from nonobservational theoretical terms to observational terms at the level of the empirical hypotheses, have important implications for the appraisal of empirical victories and defeats. In this paper, we outline the importance of auxiliary assumptions in MIL research. To ensure the validity of findings associated with MIL, we hope this paper encourages researchers to pay close attention to the auxiliary assumptions associated with their predictions.

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Introduction

Considered as one of the pillars of well-being and living a good life, the topic of meaning in life (MIL) has received enormous recent attention in psychology (King & Hicks, 2021). Researchers have examined what MIL is, its antecedents and consequences, and how meaning can be enhanced. Due to this vast attention, it is important that research findings pertaining to MIL are accurate. To achieve this, we believe it is timely that researchers are reminded about the importance of auxiliary assumptions in theoretical testing. Theories contain non-observational terms but are tested at the observational level. Auxiliary assumptions bridge the gap between the nonobservational terms at the theoretical level and the observational terms at the level of the empirical hypotheses. Therefore, whether a prediction comes true depends not only on the theoretical terms tested but also on the auxiliary assumptions associated with the prediction. Without considering auxiliary assumptions, a researcher could incorrectly conclude an empirical defeat or an empirical victory.



Researchers investigating the topic of MIL make claims about various nonobservational theoretical terms. It is therefore important that predictions in this area consider auxiliary assumptions. To make this point, the paper will briefly review MIL research. Following this, we will introduce auxiliary assumptions before applying this to research associated with life's meaning. We hope

that this paper encourages researchers in this area to take seriously the role of auxiliary assumptions when evaluating the success of their predictions.

What is MIL?

The introduction of positive psychology led to a particular interest in well-being. In a general sense, well-being consists of two dimensions: hedonia and eudaimonia (Ryan & Deci, 2001). Hedonia relates to immediate sensory pleasure, happiness, and enjoyment, while eudaimonia concerns the consequences of self-growth and self-actualization (Ryan & Deci, 2001; Ryff, 1989). A cornerstone of well-being is MIL, which is said to be an important aspect of eudaimonia (Baumeister, 1991). Researchers have found it difficult to converge on a definition of MIL (Hicks & King, 2008; Leontiev, 2013). However, recent evidence has centred on a three-dimensional view with MIL comprising significance, purpose, and coherence (Heintzelman & King, 2014; Steger, 2012). Significance relates to a sense that life is worth living; purpose is the belief that life has goals, aims, and direction; and coherence is the perception that life makes sense.

In addition to these three dimensions, MIL can be separated into two parts. First is the presence of meaning which refers to whether a person feels that their life has meaning. Second is the search for meaning which reflects the extent to which a person is seeking meaning.

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These two variables are independent, as evidenced by the small correlations between the distinct subscales measuring them (e.g., Steger et al., 2006, 2008). That is, a person seeking meaning may not necessarily lack the presence of it, and a person lacking meaning may not necessarily search for it. Since research has primarily concerned the presence of meaning, this will be the focus of the paper.

It is important to note that MIL is different to the meaning of life. Indeed, the latter concerns the ultimate answer as to what life is. A person could believe that they understand the meaning of life yet lack meaning in it. Conversely, a person could believe their life to be highly meaningful but believe life's ultimate meaning alludes them.

Antecedents of MIL

With definitions out the way, what, then, makes life more meaningful? Research has found several antecedents of MIL, with the most prominent source being interpersonal and social relationships (e.g., DeBats, 1999; Stillman et al., 2009; Wong, 1998). Broadly speaking, people sense a greater meaning when they feel connected to others (Steger & Kashdan, 2009). Another prominent contributor to MIL is happiness (Hicks & King, 2008, 2009). This is interesting because, as was mentioned earlier, life's meaning is theorized to be a function of eudaimonia, yet happiness and enjoyment are the foundations of hedonism (Deci & Ryan, 2008). Another interesting correlate is financial status (Ward & King, 2019). As an extrinsic reward, it is often claimed that money has a negative relationship with well-being (e.g., Sirgy, 1998). Increased income may, among other routes, foster MIL by enabling a person to autonomously achieve purpose (Ward & King, 2019). Other sources of meaning include perceptions of mortality (King et al., 2009; Vess et al., 2009), religiosity (Dar & Iqbal, 2019; Steger & Frazier, 2005), and belief in the supernatural (Wilt et al., 2024).

Consequences of MIL

MIL can have important benefits to well-being by improving mental (Hedayati & Khazaei, 2014) and physical (Brassai et al., 2015; Steger et al., 2009) health. Research has shown meaning relates to happiness (DeBats et al., 1993), life satisfaction (Keyes et al., 2002; Steger & Kashdan, 2007), social connectedness (Stavrova & Luhmann, 2016), and self-esteem (Newman & Nezlek, 2019). People with a greater sense of meaning are more likely to have positive relationships (Stavrova & Luhmann, 2016), appear more socially appealing

(Stillman et al., 2011), and are better able to cope with traumatic experiences (Silver & Updegraff, 2013; Updegraff et al., 2008) and common life stressors (Park & Baumeister, 2017; Ward et al., 2023). There are inverse relations between MIL and depression (Hedayati & Khazaei, 2014), post-traumatic stress disorder (Owens et al., 2009), and suicide ideation (Bryan et al., 2013; Corona et al., 2019). MIL can also play a role in health behaviors such as physical activity (Hooker & Masters, 2016) and healthy eating (Brassai et al., 2015), and can even lead to a longer life (Krause, 2009). MIL therefore appears to be an important component of a flourishing and good life (Baumeister, 1991; Frankl, 1984; Seligman, 2011).

Summary

Significant strides have been made recently in MIL research, especially in conceptualizing and understanding its antecedents and consequences. Despite this theoretical and empirical progress, it is important that research in this area is evaluated optimally. To this end, we believe that researchers should be reminded about the importance of auxiliary assumptions when evaluating predictions associated with MIL. As we shall see, auxiliary assumptions have profound implications for appraising empirical victories and defeats. We will now introduce auxiliary assumptions before relating to MIL research.

Auxiliary assumptions

Auxiliary assumptions can be understood in the context of theory falsification. Popper (1959) suggested that scientists cannot confirm a theory is true by gathering confirmatory evidence. To do so would be to commit the fallacy of affirming the consequent, which is evidenced in the following syllogism:

Syllogism 1

Premise 1: if my theory is true, the observation should be true

Premise 2: the observation is true

Conclusion: therefore, my theory is true

The problem with Syllogism 1, as Popper noted, is that the observation may be true for a reason other than the theory being true. Popper suggested that scientists

should instead deny the consequent, which is evidenced in the following syllogism:

Syllogism 2

Premise 1: if my theory is true, the observation should be true

Premise 2: the observation is not true

Conclusion: therefore, my theory is not true

Syllogism 2 alters the second premise by focusing on theoretical falsification. However, Duhem (1954) and Lakatos (1976) pointed out that predictions do not only come from the theory but also include auxiliary assumptions. That is because predictions make two levels of inferences. The first level is the theory, which contain nonobservational terms. The second level is the empirical hypotheses, which contain observational terms. We need a way to get from the nonobservational terms to the observational terms: enter auxiliary assumptions. Specifically, auxiliary assumptions bridge the gap between the nonobservational terms at the theoretical level and the observational terms at the level of the empirical hypotheses. Because our prediction now includes auxiliary assumptions, we now need to update Syllogism 2.

Syllogism 3

Premise 1: if my theory is true and the auxiliary assumptions are true, the observation should be true

Premise 2: the observation is not true

Conclusion: therefore, either my theory is not true or at least one auxiliary assumption is not true

We can see from Syllogism 3 that the addition of auxiliary assumptions complicates the appraisal of an empirical defeat. If a prediction does not come true, this empirical defeat could correctly indicate that the theory is wrong. An alternative conclusion is not that the theory is wrong, but that the empirical defeat is instead down to the presence of a false auxiliary assumption (Duhem, 1954; Earp & Trafimow, 2015; Meehl, 1978; Trafimow, 2009). Similarly, if a prediction does come true, this empirical victory could correctly indicate that

the theory is right. An alternative conclusion is not that the theory is correct, but that the empirical victory is instead down to the presence of a false auxiliary assumption (St Quinton & Trafimow, 2025). Therefore, researchers must not only consider theoretical terms but also give attention to the auxiliary assumptions attached to their prediction (St Quinton et al., 2021; Trafimow et al., 2024).

Before discussing how auxiliary assumptions relate to MIL research, let's first give some examples of these assumptions. To take a classic example from Social Psychology, suppose we wish to test whether a person's attitude correlates with their intention (Fishbein & Ajzen, 1975). Attitude and intention are non-observational theoretical terms, and these terms are typically represented at the observable level by check marks placed on a questionnaire. Although our prediction is about the relationship between two unobservable entities, this is tested by looking at the relationship between the observational measures. Therefore, we need to employ good auxiliary assumptions to bridge the gap between the unobservable theoretical entities and the observable measures. Imagine we find no correlation between attitude and intention. Thinking back to Syllogism 3, this empirical defeat could, indeed, be because the theory is incorrect. An alternative explanation is not that the theory is wrong, but that the observable measure of attitude, intention, or both, were poor. If the latter is true, the prediction failed because of a poor auxiliary assumption. Similarly, an empirical victory could be because attitude really does correlate with intention. Alternatively, it could be that a false auxiliary assumption was responsible for the predictive success.

We also need to consider auxiliary assumptions when evaluating the success of manipulations. Suppose that instead of correlations, we want to test whether modifying attitude leads to change in intention (Fishbein & Ajzen, 1975). In addition to the auxiliary assumptions mentioned above, we now have an observable manipulation targeting an unobservable theoretical entity. Therefore, we need to apply good auxiliary assumptions to bridge the gap between the unobservable attitude construct and the observable manipulation. And like the example above, an empirical defeat could correctly question the underlying theory that modifying attitude leads to intention change. Alternatively, the failed prediction may say nothing about the theory but could instead be due to at least one false auxiliary assumption. Similarly, an empirical victory could correctly support the causal role of attitude, or it could instead be because of a false auxiliary assumption.

To summarize, evaluating the success of a prediction requires the consideration of theoretical terms and

auxiliary assumptions. Failed (or successful) predictions could either be because the theory is wrong (or right) or there exists at least one faulty auxiliary assumption. Unless a researcher pays close attention to the auxiliary assumptions associated with their prediction, they cannot conclusively know which of these is the case.

Applicability to MIL research

Now that the importance of auxiliary assumptions has been made, we will now apply this to research associated with MIL. To recall, research in this area centres on making predictions about unobservable theoretical entities. As we have seen, evaluating predictions depends not only on considering theoretical terms but auxiliary assumptions too. Auxiliary assumptions therefore play an important role in MIL research. We will begin with auxiliary assumptions attached to MIL measures before moving onto those attached to measures of MIL antecedent and consequences. Following this, we refer to the auxiliary assumptions associated with MIL manipulations and then discuss research comparing predictors.

Measures of MIL

MIL is a subjective evaluation captured through measures of self-report. Many instruments have been developed, including the Purpose in Life test (Crumbaugh, 1968), the Meaningful Life Measure (Morgan & Farsides, 2009), and the MIL Questionnaire (Steger et al., 2006). In general, these measures aim to capture the extent to which people believe their life has meaning. For example, the MIL Questionnaire (Steger et al., 2006), which is the most widely used, requires participants to provide check marks to items such as 'I have a good sense of what makes my life meaningful' and 'My life has a clear sense of purpose'. The non-observable construct of meaning is therefore represented at the observable level by check marks. Thus, we need to consider the auxiliary assumptions traversing the distance from the unobservable perception about MIL to observable checkmarks purporting to measure it. There may be issues with these auxiliary assumptions, as we shall now see.

Research about MIL depends heavily on the measures assessing the construct (Hicks & King, 2009), and measures depend on the definition of MIL. Yet, there is variability in how MIL is conceptualized (Brandstätter et al., 2012). Some have questioned whether MIL should encompass additional dimensions, such as mattering (e.g., Prinzing et al., 2023) and felt sense of meaning (e.g., Hill et al., 2019). There are also theoretical overlaps

between MIL constructs (Costin & Vignoles, 2020). This absence of an agreed definition makes measuring MIL difficult (King et al., 2016) and can prevent researchers from developing predictions (George & Park, 2016). Indeed, current measures are likely imperfect (King & Hicks, 2021). For example, Martela and Steger (2016) suggest measures are too generic to capture the specific dimensions of MIL.

Some of these issues are theoretical but some concern the best way to represent non-observable perceptions about meaning at the observable level. In the latter case, these issues of measurement validity pertain to auxiliary assumptions. Specifically, they are auxiliary assumptions traversing the distance from unobservable MIL perceptions to an observable measure. The validity of MIL measures may be affected in other ways, too. Participant responses to MIL items may be prone to social desirability bias (Moon et al., 2023). The expectation to have a strong sense of MIL could inflate scores, as could the potential dissonance created when participants are asked to evaluate one's life (Friedman, 2015). Measurement responses also rely on an interpretation of words such as 'purposeful' and 'meaningful' (Hooker & Masters, 2016). And there is likely variability in how participants conceptualize MIL more broadly (Baumeister & Landau, 2018). For example, Li et al. (2022) found that laypeople did not associate comprehension and significance with MIL.

We can see here that issues exist about measures of MIL. However, these issues pertain to auxiliary assumptions, and can have profound importance when evaluating an empirical finding. Imagine a researcher makes a prediction about MIL predicting an outcome of interest. However, the researcher finds that the effect on the outcome variable is trivial. This empirical defeat could indeed be because the theory is incorrect: MIL does not predict the outcome. However, instead of a theoretical failure, the defeat could be down to a false auxiliary assumption associated with the prediction. The same logic can be applied to an empirical victory: it could be that the prediction was successful because MIL really does predict the outcome of interest. Alternatively, it may instead be down to a false auxiliary assumption. It is therefore important that researchers consider the auxiliary assumptions associated with measures of MIL. If this is not done, false conclusions could be made about the relevance of the MIL construct.

Measures of antecedents and consequences

Understanding the antecedents and consequences of MIL has been a point of substantial interest. As unobservable constructs, these antecedents and consequences

rely on observable measures. Thus, we need to consider the auxiliary assumptions traversing the distance from the unobservable antecedents and consequences to the observable measures.

Many of the antecedents and consequences associated with MIL research are measured through self-report. Questionnaire ratings should therefore represent the unobservable theoretical construct of interest. Let's look at the antecedent of religiosity, typically assessed using the Religious Commitment Inventory (Worthington et al., 2003). It is well-known that people endorse views socially desirable, especially in topics like religiosity (Jones & Elliott, 2017). Related to perceptions about meaning, Moon et al. (2023) noted concerns about religiosity assessments and the subsequent relationships with MIL. They suggested that relationships may be inflated as people prone to desirability tend to over-report their religiosity. Social desirability may also occur in research assessing income (Hariri & Lassen, 2017) and eating behavior (Freitas et al., 2017), thus questioning whether check marks correctly indicate financial status (Ward & King, 2019) and healthy eating (Brassai et al., 2015). Of course, evaluating the success of a prediction associated with MIL depends on these auxiliary assumptions. That is, an empirical defeat and victory could be because the antecedent or consequence is associated with MIL, or it could be that at least one wrong auxiliary assumption was attached to the prediction.

The importance of auxiliary assumptions not only concerns self-report measures but also that of non-observable constructs represented by objective measures. Many studies have objectively assessed MIL antecedents and consequences. For example, Stavrova and Luhmann (2016) used behavioral indicators of organizational memberships to represent the non-observable social connectedness construct. Although the researcher's found MIL was positively correlated with social connectedness, one could question whether group memberships represent social connectedness, whether participants accurately recalled their participation in these groups, whether responses were honest, and so on. Further, to investigate the potentially buffering role MIL plays in stress, Park and Baumeister (2017) asked participants to imagine themselves in various hypothetical stressful scenarios. Although ethically salient, hypothetical outcomes, of course, may not reflect how a person would actually behave. Other examples include whether accelerometers indicate physical activity (Hooker & Masters, 2016) or whether rater evaluations about social interactions indicate interpersonal appeal (Stillman et al., 2011). Again, empirical defeats and victories depend on these auxiliary assumptions.

Of course, predictions about the antecedents and consequences of MIL not only include auxiliary assumptions associated with these constructs but also include the auxiliary assumptions associated with the non-observable MIL construct. For example, to understand whether financial status is associated with MIL the researcher would need to consider: 1) the MIL theoretical construct; 2) the auxiliary assumptions traversing the gap from the unobservable MIL theoretical construct to an observable measure; 3) the financial status construct; and 4) the auxiliary assumptions traversing the gap from the unobservable financial status construct to an observable measure. The addition of this second set of auxiliary assumptions further complicates the evaluation of the prediction. In this case, an empirical defeat could correctly indicate that financial status is not associated with MIL, assuming good auxiliary assumptions. Alternatively, it may be that financial status is related to MIL but there exists a false auxiliary assumption obscuring that relation. This false auxiliary assumption could come from the set of auxiliary assumptions associated with the MIL construct, the set of auxiliary assumptions associated with the financial status construct, or both. Similarly, an empirical victory could be because financial status is associated with MIL, assuming good auxiliary assumptions. Alternatively, it may be that financial status is associated with MIL but there exists a false auxiliary assumption. Again, this could come from either or both sets of auxiliary assumptions.

Manipulations

Research has not only examined the correlates of MIL, but studies have undertaken manipulations testing whether MIL can be modified, the consequences of these modifications, or both. To appraise the success of these manipulations, researchers need to consider many auxiliary assumptions.

Like many psychological constructs, MIL is difficult to manipulate (King et al., 2016). Researchers have tried to modify the construct by targeting antecedents including mood (Hicks & King, 2009; King et al., 2006), stress (Park & Baumeister, 2017), belongingness (Lambert et al., 2013), and social exclusion (Stillman et al., 2009; Twenge et al., 2003). Of course, it is important that the manipulation modifies the targeted variable. In this sense, the manipulation should be relevant, understandable, of suitable frequency and duration, etc. (see St Quinton & Trafimow, 2022; Trafimow, 2009). Manipulation checks are often used to determine the success of the manipulation. Indeed, researchers examining the antecedents of MIL have checked differences in

mood (Hicks & King, 2009; King et al., 2006), stress (Park & Baumeister, 2017), and belongingness (Lambert et al., 2013). Similarly, researchers investigating the consequences of MIL have checked that the manipulation changed MIL (e.g., Park & Baumeister, 2017). The manipulation is deemed successful if differences are found between conditions in the hypothesized direction. The researcher would then proceed to check whether changes in the dependent variable are observed. However, the researcher cannot test the prediction if the manipulation check fails. For example, if the manipulation does not change mood or belongingness, the researcher cannot check whether mood or belongingness are antecedents of MIL. Instead, it only shows that the manipulation is unable to change the independent variable. This failure constitutes an auxiliary assumption. Researchers should therefore attach auxiliary assumptions to bridge the gap from the observable manipulation to the unobservable theoretical construct.

Yet even a successful manipulation check need not evidence an empirical victory. That is because the unobservable independent variable (e.g., mood, belongingness, stress) is represented at the observable level, and therefore requires auxiliary assumptions. It could be that the manipulation changed something else, that the measure was poor, that the researcher entered data incorrectly, and so forth. In any case, the researcher would incorrectly declare that the manipulation modified the variable of interest. Applying the same logic, a failed manipulation check need not mean that the manipulation is bad. Perhaps the observable manipulation was in fact very good at modifying the non-observable construct, but poor auxiliary assumptions were applied. Researchers therefore need to be confident that they employ good manipulation checks.

A researcher happy with the auxiliary assumptions traversing the distance from the manipulation to the unobservable construct and the observable measure to the unobservable construct would then proceed to check changes in the dependent variable. Then, if, for example, MIL differs significantly between the experimental and control conditions in the hypothesized direction, the researcher would claim an empirical victory. However, there is still one final consideration before this claim can be made. Specifically, there are auxiliary assumptions traversing the distance from the unobservable construct (dependent variable) to the observable measure. We may have an excellent manipulation and a suitable manipulation check, but at least one poor

auxiliary assumption attached to the non-observable outcome of interest. Whether the prediction comes true therefore depends also on these auxiliary assumptions.

Comparisons between constructs

Researchers are often interested in making comparisons between two or more theoretical constructs. Testing predictors simultaneously can provide important information about the predictive utility of constructs. For example, research associated with MIL can compare the contribution of specific dimensions and antecedents (e.g., Costin & Vignoles, 2020; George & Park, 2016; Hicks & King, 2009; Martela et al., 2018). As you may have guessed, evaluating these predictions relies on auxiliary assumptions. Specifically, it is important that equal attention is given to the auxiliary assumptions attached to the different constructs.

Imagine a researcher tests whether MIL is more strongly associated with positive affect than religiosity. To test this prediction, the researcher would need to consider the auxiliary assumptions traversing the distance from the unobservable affect construct to the observable measures and the unobservable religiosity construct to the observable measures. The researcher would also need to consider the auxiliary assumptions traversing the distance from the unobservable MIL construct to the observable measures. Imagine that the researcher finds positive affect to correlate more strongly with meaning than religiosity. However, further imagine that the researcher applies good auxiliary assumptions to the measure of positive affect but not to the measure of religiosity. In this scenario, the researcher cannot be sure that positive affect does indeed correlate more strongly with meaning than does religiosity.

The same logic applies to a manipulation attempt. If the same researcher was interested in comparing whether modifying positive affect or religiosity leads to greater change in MIL, she would need to give equal attention to the auxiliary assumptions associated with both manipulations. If poor auxiliary assumptions are applied to either, such as those traversing the distance from the unobservable affect construct to the observable manipulation, the researcher cannot confidently conclude superiority of the positive affect manipulation over the religiosity manipulation, or vice versa. Good auxiliary assumptions should be

attached to all theoretical constructs when a researcher wishes to make comparisons.

Summary and implications

Researchers have made some important contributions to the science of MIL. In this paper, we have reminded researchers about the importance of auxiliary assumptions in theory testing and how such assumptions can influence the evaluation of MIL predictions. There are additional issues we feel worth highlighting. First, it is important to note that the auxiliary assumptions given are not exhaustive. Rather than providing a comprehensive list, the purpose of the paper was to clarify the importance of considering these assumptions. Noting each and every auxiliary assumption would have been an impossible task anyway given the high number and variability of auxiliary assumptions associated with a prediction. This brings us to the second issue: identifying relevant auxiliary assumptions. Due to the many auxiliary assumptions attached to a prediction, researchers should seek to identify those most likely present. For example, a researcher may be more concerned about checking the appropriateness of a manipulation check than whether the data were entered correctly. Although data entry is an auxiliary issue, the researcher may be confident in its accuracy and thus give greater attention to the manipulation check. The responsibility to identify and attend to the important auxiliary assumptions lies with the researcher. Third, we are not implying that researchers have not already given attention to some of the auxiliary assumptions mentioned in the paper. Instead, we wish to draw attention to the fact that they are auxiliary assumptions and can have profound implications for MIL research. Finally, we wish to note that our comments are not critical of any previous work. On the contrary, research in this area has progressed at a vast pace in such a short period of time. Nevertheless, to keep track of this exciting line of research, it is important that auxiliary assumptions are given suitable attention.

Conclusion

There has been a recent surge in studies examining the relevance of MIL in well-being. In this paper, we have brought to the fore the importance of considering auxiliary assumptions when making predictions about MIL. Whether researchers are interested in the correlates of MIL or making experimental tests, it is important that auxiliary assumptions are considered. Not doing so could lead to false conclusions about empirical victories and defeats. If any plausible but unacknowledged auxiliary assumptions exist, there is always doubt about the

finding. To increase the validity of MIL research, we hope that this paper encourages researchers to pay close attention to the auxiliary assumptions associated with their predictions.

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No potential conflict of interest was reported by the author(s).

Data availability statement

There are no data associated with the manuscript.

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